

Physics

1. The centre of mass of an extended body on the surface of the earth and its centre of gravity
 - (a) Can never be at the same point
 - (b) Centre of mass coincides with the centre of gravity of a body if the size of the body is negligible as compared to the size (or radius) of the earth
 - (c) Are always at the same point for any size of the body
 - (d) Are always at the same point only for spherical bodies
2. A metallic rod breaks when strain produced is 0.2%. The Young's modulus of the material of the rod is $7 \times 10^9 \text{ N/m}^2$. The area of section of support a load of 10^4 N is
 - (a) $7.1 \times 10^{-4} \text{ m}^2$
 - (b) $7.1 \times 10^{-2} \text{ m}^2$
 - (c) $7.1 \times 10^{-8} \text{ m}^2$
 - (d) $7.1 \times 10^{-6} \text{ m}^2$
3. A tiny spherical oil drop carrying a net charge q is balanced in still air, with a vertical uniform electric field of strength $\frac{81}{7} \pi \times 10^5 \text{ V/m}$. When the field is switched off, the drops is observed to fall with terminal velocity $2 \times 10^{-3} \text{ ms}^{-1}$. Here $g = 9.8 \text{ m/s}^2$, Viscosity of air is $1.8 \times 10^{-5} \text{ Ns/m}^2$ and the density of oil is 900 kg m^{-3} . The magnitude of ' q ' is
 - (a) $1.6 \times 10^{-19} \text{ C}$
 - (b) $3.2 \times 10^{-19} \text{ C}$
 - (c) $0.8 \times 10^{-19} \text{ C}$
 - (d) $8 \times 10^{-19} \text{ C}$
4. "Heat cannot be itself flow from a body at lower temperature to a body at higher temperature". This statement corresponds to
 - (a) Conservation of mass
 - (b) First law of thermodynamics
 - (c) Second law of Thermodynamics
 - (d) Conservation of momentum
5. A smooth chain of length 2 m is kept on a table such that its length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. The work done in pulling the entire chain on the table is, (Take $g = 10 \text{ m/s}^2$)
 - (a) 3.6 J
 - (b) 2.0 J
 - (c) 12.9 J
 - (d) 6.3 J
6. The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration of the moto wheel is
 - (a) $6\pi \text{ rad/s}^2$
 - (b) $8\pi \text{ rad/s}^2$
 - (c) $2\pi \text{ rad/s}^2$
 - (d) $4\pi \text{ rad/s}^2$

7. Four charges $+a, +2q, +q$ and $-2q$ are placed at the corners of a square ABCD respectively. The force on the positive charge kept the centre O is
- Along the diagonal AC
 - Perpendicular to side AB
 - Zero
 - Along the diagonal BD
8. An electric dipole with dipole moment $4 \times 10^{-9} \text{ Cm}$ is aligned at 30° with the direction of a uniform electric field of magnitude $5 \times 10^4 \text{ NC}^{-1}$, the magnitude of the torque acting on the dipole is
- 10^{-5} N m
 - $10 \times 10^{-3} \text{ Nm}$
 - 10^{-4} Nm
 - $\sqrt{3} \times 10^{-4} \text{ Nm}$
9. A charged particle of mass 'm' and charge 'q' is released from rest in an uniform electric field $\vec{E}$. Neglecting the effect of gravity, the kinetic energy of the charged particle after 't' seconds is
- $\frac{Eqm}{t}$
 - $\frac{E^2 q^2 t^2}{2m}$
 - $\frac{2E^2 t^2}{mq}$
 - $\frac{E^2 q^2 m}{2t^2}$
10. The electric field and the potential of an electric dipole vary with distance r as
- $\frac{1}{r^2}$ and $\frac{1}{r^3}$
 - $\frac{1}{r^3}$ and $\frac{1}{r^2}$
 - $\frac{1}{r}$ and $\frac{1}{r^2}$
 - $\frac{1}{r^2}$ and $\frac{1}{r}$
11. The displacement of a particle executing SHM is given by $x = 3 \sin \left[2\pi t + \frac{\pi}{4} \right]$ where 'x' is in meters and 't' is in seconds. The amplitude and maximum speed of the particle is
- 3 m, $6\pi \text{ ms}^{-1}$
 - 3 m, $8\pi \text{ ms}^{-1}$
 - 3 m, $2\pi \text{ ms}^{-1}$
 - 3 m, $4\pi \text{ ms}^{-1}$
12. Electric as well as gravitational affects can be thought to be caused by fields. Which of the following is true for an electrical or gravitational field?
- Fields are useful for understanding forces acting through a distance
 - There is no way to verify the existence of a force field since it is just a concept
 - The field concept is often used to describe contact forces
 - Gravitational or Electric fields does not exist in the space around an object

13. A charged particle is moving in an electric field of $3 \times 10^{-10} \text{Vm}^{-1}$ with mobility $2.5 \times 10^{-6} \text{m}^2/\text{v/s}$, its drift velocity is

- (a) $2.5 \times 10^4 \text{ m/s}$ (b) $1.2 \times 10^{-4} \text{ m/s}$
(c) $7.5 \times 10^{-4} \text{ m/s}$ (d) $8.33 \times 10^{-4} \text{ m/s}$

14. Wire bound resistors are made by

- (a) Winding the wires of an alloy of Ge, Au, GA
(b) Winding the wires of an alloy of Manganin, constantan, Nichrome
(c) Winding the wires of an alloy of Cu, Al, Ag
(d) Winding the wires of an alloy of Si, Tu, F e

15. Ten identical cells each of potential ' E ' and internal resistance ' r ', are connected in series to form a closed circuit. An ideal voltmeter connected across three cells, will read

- (a) 13 E (b) 7 E
(c) 10 E (d) 3E

16. In an atom electron revolve around the nucleus along a path of radius $0.72 \text{\AA}$ making 9.4×10^{18} revolutions per second the equivalent current is [Given $e = 1.6 \times 10^{-19} \text{C}$]

- (a) 1.4 A (b) 1.8 A
(c) 1.2 A (d) 1.5 A

17. When a metal conductor connected to left gap of a meter bridge is heated, the balancing point

- (a) Remains unchanged (b) Shifts to the center
(c) Shifts towards right (d) Shifts towards left

18. Two tiny spheres carrying charges $1.8 \mu\text{C}$ and $2.8 \mu\text{C}$ are located at 40 cm apart. The potential at the mid-point of the line joining the two charges is

- (a) $4.3 \times 10^4 \text{ V}$ (b) $3.6 \times 10^5 \text{ V}$
(c) $3.8 \times 10^4 \text{ V}$ (d) $2.1 \times 10^5 \text{ V}$

19. A parallel plate capacitor is charged by connecting a 2 V battery across it. It is then disconnected from the battery and a glass slab is introduced between plates. Which of the following pairs of quantities decrease?

- (a) Energy stored and capacitance
(b) Capacitance and charge
(c) Charge and potential difference
(d) Potential difference and energy stored

20. A proton moves with a velocity of $5 \times 10^6 \hat{j} \text{ ms}^{-1}$ through the uniform electric field, $\vec{E} = 4 \times 10^6 [2\hat{i} + 0.2\hat{j} + 0.1\hat{k}] \text{ Vm}^{-1}$ and the uniform magnetic field $\vec{B} = 0.2[\hat{i} + 0.2\hat{j} + \hat{k}] \text{ T}$. The approximate net force acting on the proton is
- (a) $2.2 \times 10^{-13} \text{ N}$ (b) $20 \times 10^{-13} \text{ N}$
 (c) $5 \times 10^{-13} \text{ N}$ (d) none
21. A solenoid of length 50 cm having 100 turns carries a current of 2.5A. The magnetic field at one end of the solenoid is
- (a) $1.57 \times 10^{-4} \text{ T}$ (b) $9.42 \times 10^{-4} \text{ T}$
 (c) $3.14 \times 10^{-4} \text{ T}$ (d) $6.28 \times 10^{-4} \text{ T}$
22. A galvanometer of resistance 50Ω is connected to a battery of 3 V along with a resistance 2950Ω in series. A full-scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be
- (a) 5050Ω (b) 4450Ω
 (c) 6050Ω (d) 5550Ω
23. A circular coil of wire of radius 'r' has 'n' turns and carries a current 'I'. The magnetic induction 'B' at a point on the axis of the coil at a distance $\sqrt{3}r$ from its centre is
- (a) $\frac{\mu_0 nI}{16r}$ (b) $\frac{\mu_0 nI}{4r}$
 (c) $\frac{\mu_0 nI}{32r}$ (d) $\frac{\mu_0 nI}{8r}$
24. If voltage across a bulb rated 220 V, 100 W drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is
- (a) 5% (b) 10%
 (c) 20% (d) 2.5%
25. A wire of certain material is stretched slowly by 10%. Its new resistance and specific resistance becomes respectively
- (a) 1.21 times, same (b) both remains the same
 (c) 1.1 times, 1.1 times (d) 1.2 times, 1.1 times
26. A fully charged capacitor 'C' with initial charge 'q₀' is connected to a coil of self-inductance 'L' at $t = 0$. The time at which the energy is stored equally between the electric and the magnetic field is
- (a) $\pi\sqrt{LC}$ (b) $\frac{\pi}{4}\sqrt{LC}$
 (c) $2\pi\sqrt{LC}$ (d) $\sqrt{LC}$
27. A magnetic field of flux density 1.0 Wbmm^{-2} acts normal to a 80 turn coil of 0.01 m^2 area. If this coil is removed from the field in 0.2 second, the emf induced in it is
- (a) 0.8 V (b) 5 V

- (c) 4 V (d) 8 V

28. An alternating current is given by $i = i_1 \sin \omega t + i_2 \cos \omega t$. The r.m.s current is given by

- (a) $\sqrt{\frac{i_1^2 + i_2^2}{2}}$ (b) $\sqrt{\frac{i_1^2 + i_2^2}{\sqrt{2}}}$
 (c) $\frac{i_1 + i_2}{\sqrt{2}}$ (d) $\frac{i_1 - i_2}{\sqrt{2}}$

29. Which of the following statements proves that Earth has a magnetic field?

- (a) Earth is surrounded by ionosphere
 (b) A large quantity of iron-ore is found in the Earth
 (c) The intensity of cosmic rays stream of charged particles is more at the poles than at the equator.
 (d) Earth is a planet rotating about the North south axis

30. A long solenoid has 500 turns, When a current of 2 A is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb, then self induction of the solenoid is

- (a) 2.0 henry (b) 1.0 henry
 (c) 4.0 henry (d) 2.5 henry

31. Which of the following radiations of electromagnetic waves has the highest wavelength?

- (a) IR-rays (b) Microwaves
 (c) X-rays (d) UV-rays

32. The power of a equi-concave lens is -4.5 and is made of an material of R.I. 1.6, the radii of curvature of the lens is

- (a) -2.66 cm\$ (b) 115.44 cm
 (c) -26.6 cm\$ (d) +36.6 cm\$

33. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to $\frac{3}{4}$ of the angle of the prism. The angle of deviation is

- (a) 20° (b) 30°
 (c) 45° (d) 39°

34. A convex lens of focal length ' f ' is placed somewhere in between an object and a screen, the distance between the object and the screen is ' x '. If the numerical value of the magnification produced by the lens is ' m ', then the focal length of the lens is

- (a) $\frac{(m+1)^2 x}{m}$ (b) $\frac{(m-1)^2 x}{m}$

(c) $\frac{mx}{(m+1)^2}$ (d) $\frac{mx}{(m-1)^2}$

35. A series resonant ac circuit contains a capacitance 10^{-6}F and an inductor of 10^{-4}H . The frequency of electrical oscillations will be

- (a) $\frac{10^5}{2\pi}$ Hz (b) $\frac{10}{2\pi}$ Hz
(c) 10^5 Hz (d) 10 Hz

36. In a series LCR circuit $R = 300\Omega$, $L = 0.9\text{H}$, $C = 2.0\mu\text{F}$ and $\omega = 1000\text{rad/sec}$, then impedance of the circuit is

- (a) 500Ω (b) 400Ω
(c) 1300Ω (d) 900Ω

37. For light diverging from a finite point source

- (a) The wave front is parabolic
(b) The intensity at the wave front does not depend on the distance
(c) the wave front is cylindrical
(d) the intensity decreases in proportion to the distance squared

38. The fringe width for red colour as compared to that for violet colour is approximately

- (a) 4 times (b) 8 times
(c) 3 times (d) Double

39. In case of Fraunhofer diffraction at a single slit the diffraction pattern on the screen is correct for which of the following statements?

- (a) Central dark band having uniform brightness on either side.
(b) Central bright band having dark bands on either side.
(c) Central dark band having alternate dark and bright bands of decreasing intensity on same side.
(d) Central bright band having alternate dark and bright bands of decreasing intensity on either side.

40. When a Compact Disc (CD) is illuminated by small source of white light coloured bands observed. This is due to

- (a) Interference (b) Reflection
(c) Scattering (d) Diffraction

41. Consider a glass slab which is silvered at one side and the other side is transparent. Given the refractive index of the glass slab to be 1.5. If slab is

- (a) 120° (b) 45°

- (c) 90° (d) 180°

42. Focal length of a convex lens will be maximum for

- (a) Green light (b) Red light
(c) Blue light (d) Yellow light

43. The de-Broglie wavelength of a particle of kinetic energy 'K' is λ ; the wavelength of the particle, if its kinetic energy is $\frac{K}{4}$ is

- (a) $\frac{\lambda}{2}$ (b) 4λ
(c) λ (d) 2λ

44. The radius of hydrogen atom in the ground state is $0.53\text{\AA}$. After collision with an electron, it is found to have a radius of $2.12\text{\AA}$, the principle quantum number 'n' of the final state of the atom is

- (a) $n = 3$ (b) $n = 4$
(c) $n = 1$ (d) $n = 2$

45. In accordance with the Bohr's model, the quantum number that characterises the Earth's revolution around the sun in orbit of radius $1.5 \times 10^{11}\text{ m}$ with orbital speed $3 \times 10^4\text{ ms}^{-1}$ is [given mass of Earth = $6 \times 10^{24}\text{ kg}$]

- (a) 8.57×10^{64} (b) 2.57×10^{74}
(c) 5.98×10^{86} (d) 2.57×10^{38}

46. If an electron is revolving in its Bohr orbit having Bohr radius of $0.529\text{\AA}$, then the radius of third orbit is

- (a) $4.761\text{\AA}$ (b) 5125 nm
(c) 4234 nm (d) $4496\text{\AA}$

47. Binding energy of a Nitrogen nucleus [${}^{14}_7\text{N}$], given $m[{}^{14}_7\text{N}] = 14.00307\text{u}$

- (a) 206.5 MeV (b) 78 MeV
(c) 104.7 MeV (d) 85 MeV

48. In a photo electric experiment, if both the intensity and frequency of the incident light are doubled, then the saturation photo electric current

- (a) Is doubled (b) Becomes four times
(c) Remains constant (d) Is halved

49. The kinetic energy of the photoelectrons increases by 0.52 eV when the wavelength of incident light is changed from 500 nm to another wavelength which is approximately

- (a) 1250 nm (b) 1000 nm

- (c) 700 nm (d) 400 nm

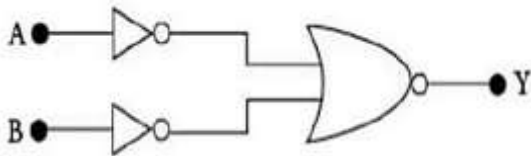
50. The resistivity of a semiconductor at room temperature is in between

- (a) 10^6 to $10^8 \Omega\text{cm}$ (b) 10^{10} to $10^{12} \Omega\text{cm}$
(c) 10^{-2} to $10^{-5} \Omega\text{cm}$ (d) 10^{-3} to $10^6 \Omega\text{cm}$

51. The forbidden energy gap for 'Ge crystal at '0'K is Options:

- (a) 2.57 eV (b) 6.57 eV
(c) 0.071 eV (d) 0.71 eV

52. Which logic gate is represented by the following combination of logic gates?



- (a) AND (b) NOR
(c) OR (d) NAND

53. A metallic rod of mass unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. A magnetic field of strength 0.25 T is acting on it in the vertical direction. When a current 'T' is flowing through it, the rod is not allowed to slide down. The quantity of current required to keep the rod stationary is

- (a) 14.76 A (b) 11.32 A
(c) 7.14 A (d) 5.98 A

54. A nuclear reactor delivers a power of 10^9 W , the amount of fuel consumed by the reactor in one hour is

- (a) 0.72 g (b) 0.96 g
(c) 0.04 g (d) 0.08 g

55. Which of the following radiations is deflected by electric field?

- (a) γ -rays (b) α -particles
(c) X-rays (d) Neutrons

56. Two objects are projected at an angle 0° and $(90 - \theta)^\circ$, to the horizontal with the same speed. The ratio of their maximum vertical heights is

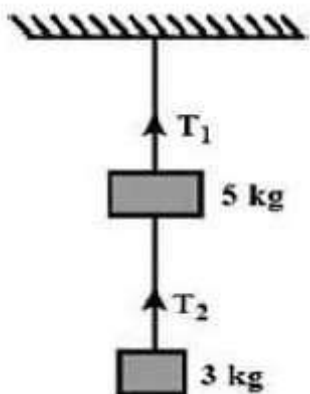
- (a) $1: \tan \theta$ (b) $\tan^2 \theta: 1$
(c) $1: 1$ (d) $\tan \theta: 1$

57. A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10 ms^{-1} . A bob is suspended from the roof of the car by a light wire of length 1.0 m . The angle made by the wire with the vertical is (in radian)

- (a) 0 (b) $\frac{\pi}{3}$

- (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{4}$

58. Two masses of 5 kg and 3 kg are suspended with the help of massless inextensible strings as shown in figure, when whole system is going upwards with acceleration 2 m/s^2 , the value of T_1 is (use $g = 9.8 \text{ m/s}^2$)



- (a) 23.6 N (b) 59 N
(c) 94.4 N (d) 35.4 N

59. The Vernier scale of a travelling microscope has 50 divisions which coincides with 49 main scale divisions. If each main scale division is 0.5 mm, then the least count of the microscope is

- (a) 0.01 mm (b) 0.5 cm
(c) 0.01 cm (d) 0.5 mm

60. The displacement 'x' (in meter) of a particle of mass 'm' (in kg) moving in one dimension under the action of a force, is related to time 't' (in sec) by, $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero, will be

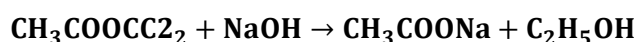
- (a) 6 m (b) 2 m
(c) 4 m (d) 0 m

Chemistry

61. A first order reaction is half completed in 45 min. How long does it need 99.9% of the reaction to be completed?

- (a) 10 Hours (b) 20 Hours
(c) 5 Hours (d) 7.5 Hours

62. The rate of the reaction



is given by the equation, Rate $K[\text{CH}_3\text{COOC}_2\text{H}_5][\text{NaOH}]$. If concentration is expressed in mol L^{-1} , the unit of K is

- (a) $\text{Lmol}^{-1} \text{ s}^{-1}$ (b) s^{-1}

(c) $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$ (d) $\text{molL}^{-1} \text{s}^{-1}$

63. Colloidal solution commonly used in the treatment of skin disease is

(a) Colloidal Gold (b) Colloidal Antimony

(c) Colloidal Sulphur (d) Colloidal Silver

64. Specific conductance of 0.1M HNO_3 is $6.3 \times 10^{-2} \text{ohm}^{-1} \text{cm}^{-1}$. The molar conductance of the solution is

(a) $6.300 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$ (b) $63.0 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

(c) $630 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$ (d) $315 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

65. For spontaneity of a cell, which is correct?

(a) $\Delta G = +ve, \Delta E = +ve$ (b) $\Delta G = -ve$

(c) $\Delta G = 0, \Delta E = 0$ (d) $\Delta G = -ve, \Delta E = 0$

66. For n^{th} of reaction, Half-life period is directly proportional to

(a) a^{n-1} (b) a^{1-n}

(c) $\frac{1}{a^{n-1}}$ (d) $\frac{1}{a^{1-n}}$

67. Half-life of a reaction is found to be inversely proportional to the fifth power is initial concentration, the order of reaction is

(a) 5 (b) 6

(c) 3 (d) 4

68. The strong reducing property of hypo-phosphorous acid is due to

(a) Two P-H bonds

(b) Presence of phosphorus in its highest oxidation state

(c) Its concentration

(d) The positive valency of phosphorus

69. A transition metal exists in its highest oxidation state. It is expected to behave as

(a) An oxidizing agent

(b) A reducing agent

(c) A chelating agent

(d) A central metal in a co-ordination compound

70. What will be the value of x in Fe^{x+} , if the magnetic moment $\mu = \sqrt{24} \text{BM}$?

(a) 0 (b) +1

- (c) +2 (d) +3

71. Which can adsorb larger of hydrogen gas?

- (a) Finely divided platinum
(b) Colloidal $\text{Fe}(\text{OH})_3$
(c) Finely divided nickel
(d) Colloidal solution of palladium

72. The property of halogens which is not correctly matched is

- (a) $\text{I} > \text{Br} > \text{Cl} > \text{F}$ (density)
(b) $\text{F} > \text{Cl} > \text{Br} > \text{I}$ (electron gain enthalpy)
(c) $\text{F} > \text{Cl} > \text{Br} > \text{I}$ (ionization enthalpy)
(d) $\text{F} > \text{Cl} > \text{Br} > \text{I}$ (electronegativity)

73. Which noble gas has least tendency to form compounds?

- (a) Ar (b) Kr
(c) He (d) Ne

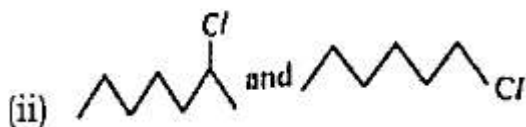
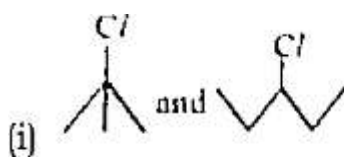
74. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ on heating liberates a gas. The same gas will be obtained by

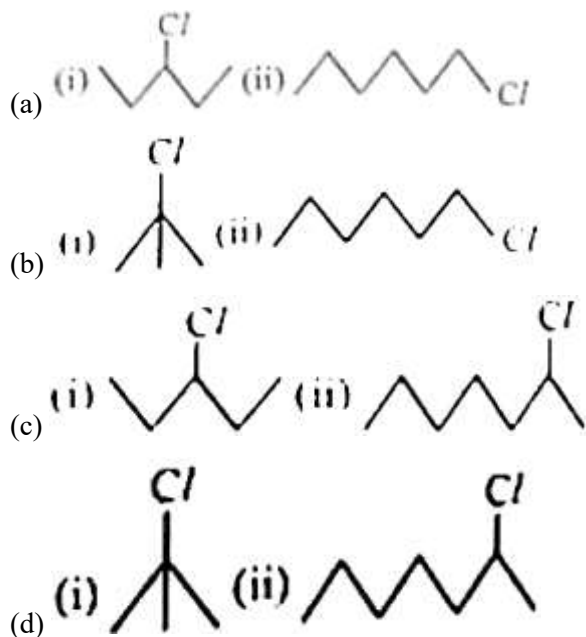
- (a) Treating H_2O_2 with NaNO_2
(b) Treating Mg_3N_2 with H_2O
(c) Heating NH_4NO_3
(d) Heating NH_4NO_2

75. The complex hexamine platinum (IV) chloride will give number of ions on ionization.

- (a) 3 (b) 2
(c) 5 (d) 4

76. In the following pairs of halogen compounds, which compound undergoes faster SN^1 reaction?





77. The only Lanthanoid which is radioactive

- (a) Promethium (b) Praseodymium
(c) Lanthanum (d) Cerium

78. All Cu(II) halides are known, except the iodide, the reaction for it is that

- (a) Cu^{+2} has much more negative hydration enthalpy
(b) Cu^{+2} ion has smaller size
(c) Iodide is bulky ion
(d) Cu^{+2} oxidises iodide to iodine

79. The correct IUPAC name of cis-platin is

- (a) Diammine dichloride platinum (0)
(b) Dichlorido diammine platinum (IV)
(c) Diammine dichlorido platinum (II)
(d) Diammine dichloride platinum (IV)

80. Crystal Field Splitting Energy (CFSE) for $[\text{CoCl}_6]^{4-}$ is 18000 cm^{-1} . The Crystal Field Splitting Energy (CFSE) for $[\text{CoCl}_4]^{2-}$ will be

- (a) 8000 cm^{-1} (b) $10,000 \text{ cm}^{-1}$
(c) $18,000 \text{ cm}^{-1}$ (d) $16,000 \text{ cm}^{-1}$

81. The major product obtained when ethanol is heated with excess of conc H_2SO_4 at at 443 K is

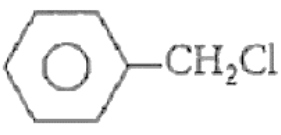
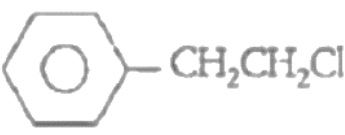
- (a) ethane (b) methane
(c) ethene (d) ethyne

82. Among the following, the products formed by the reaction of anisole with H I are

- (a) Benzene + Methanol

- (b) Phenol + Methane
- (c) Phenol + Iodomethane
- (d) Sodium phenate + Methanol

83. Which one of the following Chlorohydrocarbon readily undergoes solvolysis?

- (a)  (b) 
- (c) $\text{CH}_2 = \text{CHCl}$ (d) 

84. Identify the products A and B in the reactions:



- (a) A = RNC; B = RCN
- (b) A = RNC; B = RNC
- (c) A = R - CN; B = RCN
- (d) A = RCN; B = RNC

85. An organic compound with molecular formula $\text{C}_7\text{H}_8\text{O}$ dissolves in NaOH and gives a characteristic colour with FeCl_3 . On treatment with bromine, it gives a tribromo derivative $\text{C}_7\text{H}_5\text{OBr}_3$. The compound is

- (a) m-Cresol
- (b) p-Cresol
- (c) Benzyl alcohol
- (d) o-Cresol

86. In Kolbes reaction the reacting substances are

- (a) Sodium phenate and CCl_4
- (b) Phenol and CHCl_3
- (c) Sodium phenate and CO_2
- (d) Phenol and CCl_4

87. In Carbylamine test for primary amines the resulting foul smelling product is

- (a) CH_3NC
- (b) COCl_2
- (c) CH_3NCl_2
- (d) CH_3CN

88. Ethanoic acid undergoes Hell-Volhard Zelinsky reaction but Methanoic acid does not, because of

- (a) absence of α - H atom in ethanoic acid
- (b) higher acidic strength of ethanoic acid than methanoic acid
- (c) presence of α - H atom in methanoic acid
- (d) presence of α - H atom in ethanoic acid

89. The general name of the compound formed by the reaction between aldehyde and alcohol is

- (a) Glycol (b) Acetate
(c) Ester (d) Acetal

90. Reaction by which benzaldehyde can -not be prepared is

- (a) Toulene $\xrightarrow[\text{(ii)H}_3\text{O}^+]{\text{(i)CrO}_2\text{Cl}_2\text{inCS}_2}$
- (b) Benzoyl chloride $+ \text{H}_2 \xrightarrow[\Delta]{\text{Pd} - \text{BaSO}_4}$
- (c) Benzene $+ \text{CO} + \text{HCl} \xrightarrow{\text{anhydrous AlCl}_3}$
- (d) Benzoic acid $\xrightarrow{\text{Zn} - \text{Hg and Conc. HCl}}$

91. The test to differentiate between pentan- 2 -one and pentan-3-one is

- (a) Fehling's test (b) Iodoform test
(c) Baeyer's test (d) Benedict's test

92. A secondary amine is

- (a) a compound with an NH_2 group on the carbon atom in number 2 position
(b) a compound in which 2 of the hydrogen of N_3 have been replaced by organic groups
(c) an organic compound with two NH_2 group
(d) a compound with two carbon atom and an NH_2 group

93. Which of the following is correctly matched?

- (a) Bakelite - Novolac
(b) Polyester - tetrafluoroethene
(c) Nylon - acrylonitrile
(d) Teflon - copralactum

94. Which institute has approved the emergency use of 2 -deoxy-D-Glucose as additive therapy for COVID - 19 patients?

- (a) Ministry of Health and Family Welfare
(b) Drug Controlled General of India
(c) Indian Council of Medical Research
(d) World Health Organization

95. A Nucleic acid, whether DNA or RNA gives on complete hydrolysis, two purines bases, two pyrimidine bases, a pentose sugar and phosphoric acid. Nucleotides which are intermediate products in the hydrolysis contain

- (a) purine or pyrimidine base and orthophosphoric acid
(b) purine or pyrimidine base, a pentose sugar and ortho-phosphoric acid
(c) purine or pyrimidine base and pentose sugar
(d) a purine base, pentose sugar and orthophosphoric acid

96. Which is most VISCOUS?

- (a) Ethylene glycol (b) Glycerol
(c) Methanol (d) Ethanol

97. The volume of 2.8 g of CO at 27°C and 0.821 atm, pressure is ($R=0.08210 \text{ lit. atm.} \cdot \text{K}^{-1} \text{ mol}^{-1}$)

- (a) 3 litres (b) 30 litres
(c) 0.3 litres (d) 1.5 litres

98. The work done when 2 moles of an ideal gas expands reversibly and isothermally from a volume

- (a) 0.115 kJ (b) 58.5 kJ
(c) 11.5 kJ (d) 5.8 kJ

99. An aqueous solution of alcohol contains 18 g of water and 414 g of ethyl alcohol. The mole fraction of water is

- (a) 0.7 (b) 0.9
(c) 0.1 (d) 0.4

100. If wavelength of photon is $2.2 \times 10^{-11} \text{ m}$ and $h = 6.6 \times 10^{-34} \text{ Js}$, then momentum of photon

- (a) $1.452 \times 10^{-44} \text{ kg ms}^{-1}$ (b) $6.89 \times 10^{43} \text{ kgms}^{-1}$
(c) $3 \times 10^{-23} \text{ kg ms}^{-1}$ (d) $3.33 \times 10^{-22} \text{ kgms}^{-1}$

101. Elements X, Y and Z have atomic number 19, 37 and 55 respectively. Which of the following statements is true about them?

- (a) Z would have the highest ionization potential
(b) Y would have the highest ionization potential
(c) Their ionization potential would increase with increasing atomic number
(d) Y would have an ionization potential between those of X and Z

102. In oxygen and carbon molecule the bonding is Options:

- (a) O_2 : 1σ , 1π ; C_2 : 0σ , 2π
(b) O_2 : 0σ , 2π ; C_2 : 2σ , 0π
(c) O_2 : 1σ , 1π ; C_2 : 1σ , 1π
(d) O_2 : 2σ , 0π ; C_2 : 0σ , 2π

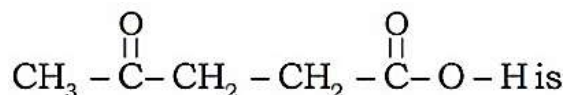
103. Amphoteric oxide among the following:

- (a) Ag_2O (b) SnO_2
(c) BeO (d) CO_2

104. Which property of CO_2 makes it biologically and geo-chemically important?

- (a) Its low solubility in water
- (b) Its high compressibility
- (c) Its acidic nature
- (d) Its colourless and odourless nature

105. The IUPAC name for



- (a) 1-carboxybutan-3-one
- (b) 4-oxopentanoic acid
- (c) 1-hydroxy pentane-1, 4-dione
- (d) 1,4-dioxopentanol

106. 1 mole of HI is heated in a closed container of capacity of 2 L. At equilibrium half a mole of HI is dissociated The equilibrium constant of the reaction is

- (a) 0.25
- (b) 0.35
- (c) 1
- (d) 0.5

107. Which among the following has highest pH ?

- (a) $1\text{M H}_2\text{SO}_4$
- (b) 0.1M NaOH
- (c) 1M HCl
- (d) 1M NaOH

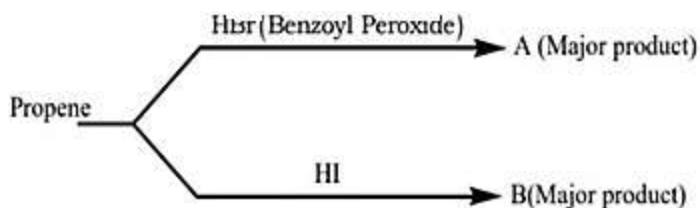
108. In which of the following compounds, an element exhibits two different oxidation states?

- (a) N_2H_4
- (b) N_3H
- (c) NH_2CONH_2
- (d) NH_4NO_3

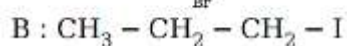
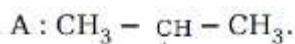
109. Which of the following hydrides is electron deficient?

- (a) CH_4
- (b) B_2H_6
- (c) NaH
- (d) CaH_2

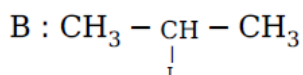
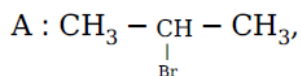
110. Identify A and B in the reaction



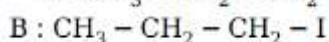
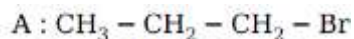
- (a)



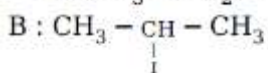
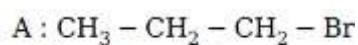
(b)



(c)



(d)



111. Vacant space in body centered cubic lattice unit cell is about

- (a) 23% (b) 46%
(c) 32% (d) 10%

112. How many number of atoms are there in a cube based unit cell, having one atom on each corner and 2 atom on each body diagonal of cube?

- (a) 4 (b) 9
(c) 8 (d) 6

113. Which of the following is NOT true about the amorphous solids?

- (a) Amorphous solids can be moulded by heating
(b) They are anisotropic in nature
(c) On heating they may become crystalline at certain temperature
(d) They may become crystalline on keeping for long time.

114. Which of the following colligative properties can provide molar mass of proteins, polymers, and colloids with greater precision?

- (a) Depression in freezing point
(b) Osmotic pressure
(c) Relative lowering of vapour pressure
(d) Elevation in boiling point

115. In Fuel cells ____ are used as catalysts.

- (a) Zinc – Mercury (b) Lead - Manganese
(c) Platinum – Palladium (d) Nickel - Cadmium

116. The molar conductivity is maximum for the solution of concentration

- (a) 0.005 M (b) 0.001 M
(c) 0.004 M (d) 0.002 M

117. Alkali halides do not show dislocation defect because

- (a) Cations and anions have almost equal size
(b) There is large difference in size of cations and anions
(c) Cations and anions have low co-ordination number.
(d) Anions cannot be accommodated in vacant spaces.

118. Solubility of a gas in a liquid - increases with

- (a) increase of P and decrease of T
(b) decrease of P and decrease of T
(c) increase of P and increase of T
(d) decrease of P and increase of T

119. The rise in boiling point of a solution containing 1.8 g of glucose in 100 g of solvent is 0.1°C The molal elevation constant of the liquid is

- (a) 2 K kg/mol (b) 10Kkg/mol
(c) 0.1Kkg/mol (d) 1Kkg/mol

120. If 3 g of glucose (molar mass = 180 g) is dissolved in 60 g of water at 15°C , the osmotic pressure of the solution will be

- (a) 6.57 atm (b) 5.57 atm
(c) 0.34 atm (d) 0.65 atm

Mathematics

121. If all permutations of the letters of the word MASK are arranged in the order as in dictionary with or without meaning, which one of the following is 19th word?

- (a) KAMS (b) AKMS
(c) SAKM (d) AMSK

122. If $a_1, a_2, a_3, \dots, a_{10}$ is a geometric progression and $\frac{a_3}{a_1} = 25$, then $\frac{a_9}{a_5}$ equals

- (a) $3(5^2)$ (b) 5^3
(c) 5^4 (d) $2(5^2)$

123. If the straight line $2x - 3y + 17 = 0$ is perpendicular to the line passing through the points $(7, 17)$ and $(15, \beta)$, then β equals

- (a) -5 (b) 29
(c) 5 (d) -29

124. The octant in which the point $(2, -4, -7)$ lies is

- (a) Eighth (b) Fourth
(c) Third (d) Fifth

125. If $f(x) = \begin{cases} x^2 - 1 & 0 < x < 2 \\ 2x + 3 & 2 \leq x < 3 \end{cases}$ the quadratic equation whose roots are $\lim_{x \rightarrow 2^-} f(x)$ and $\lim_{x \rightarrow 2^+} f(x)$ is

- (a) $x^2 - 14x + 49 = 0$ (b) $x^2 - 6x + 9 = 0$
(c) $x^2 - 10x + 21 = 0$ (d) $x^2 - 7x + 8 = 0$

126. If $3x + i(4x - y) = 6 - i$ where x and y are real numbers, then the values of x and y are respectively,

- (a) 3,9 (b) 2,9
(c) 2,4 (d) 3,4

127. If the standard deviation of the numbers $-1, 0, 1, k$ is $\sqrt{5}$ where $k > 0$, then k is equal to

- (a) $4\sqrt{\frac{5}{3}}$ (b) $2\sqrt{\frac{10}{3}}$
(c) $\sqrt{6}$ (d) $2\sqrt{6}$

128. If the set x contains 7 elements and set y contains 8 elements, then the number of bijections from x to y is

- (a) 0 (b) $7!$
(c) $8P_7$ (d) $8!$

129. If $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by

$$f(x) = \begin{cases} 2x & : x > 3 \\ x^2 & : 1 < x \leq 3 \\ 3x & : x \leq 1 \end{cases}$$

then $f(-1) + f(2) + f(4)$ is

- (a) 5 (b) 9
(c) 10 (d) 14

130. Let the relation R is defined in N by aRb , if $3a + 2b = 27$ then R is Options:

- (a) $\{(1,12)(3,9)(5,6)(7,3)\}$
(b) $\{(1,12)(3,9)(5,6)(7,3)(9,0)\}$

(c) $\left\{\left(0, \frac{27}{2}\right)(1,12)(3,9)(5,6)(7,3)\right\}$

(d) $\{(2,1)(9,3)(6,5)(3,7)\}$

131. $\lim_{y \rightarrow 0} \frac{\sqrt{3+y^3}-\sqrt{3}}{y^3} =$

(a) $\frac{1}{2\sqrt{3}}$ (b) $2\sqrt{3}$

(c) $\frac{1}{3\sqrt{2}}$ (d) $3\sqrt{2}$

132. If A is a matrix of order 3×3 , then $(A^2)^{-1}$ is equal to

(a) $(-A^2)^2$ (b) A^2

(c) $(A^{-1})^2$ (d) $(-A)^{-2}$

133. If $A = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}$, then the inverse of the matrix A^3 is

(a) A (b) 1

(c) -1 (d) -A

134. If A is a skew symmetric matrix, then A^{2021} is

(a) Row matrix (b) Symmetric matrix

(c) Column matrix (d) Skew symmetric matrix

135. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then $(aI + bA)^n$ is (where I is the identity matrix of order 2)

(a) $a^2I + a^{n-1}b \cdot A$ (b) $a^nI + na^n bA$

(c) $a^nI + n \cdot a^{n-1}b \cdot A$ (d) $a^nI + b^nA$

136. If A is a 3×3 matrix such that $|5 \cdot \text{adj } A| = 5$ then $|A|$ is equal to Options:

(a) ± 1 (b) $\pm 1/5$

(c) $\pm 1/25$ (d) ± 5

137. If there are two values of 'a' which makes determinant

$\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$ Then the sum of these numbers is

(a) -4 (b) 4

(c) 9 (d) 5

138. If the vertices of a triangle are $(-2, 6)(3, -6)$ and $(1, 5)$, then the area of the triangle is

(a) 40 sq. units (b) 30 sq. units

- (c) 15.5 sq. units (d) 35 sq. units

139. Domain of $\cos^{-1}[x]$ is, where $[.]$ denotes a greatest integer function

- (a) $(-1, 2]$ (b) $[-1, 2]$
(c) $(-1, 2)$ (d) $[-1, 2)$

140. If $y = (1 + x^2)\tan^{-1}x - x$ then $\frac{dy}{dx}$ is

- (a) $2x\tan^{-1}x$ (b) $x^2\tan^{-1}x$
(c) $\frac{\tan^{-1}x}{x}$ (d) $x\tan^{-1}x$

141. If $x = e^\theta \sin \theta$, $y = e^\theta \cos \theta$ where θ is a parameter, then $\frac{dy}{dx}$ at $(1, 1)$ is equal to

- (a) 0 (b) $-\frac{1}{2}$
(c) $\frac{1}{2}$ (d) $-\frac{1}{4}$

142. If $y = e^{\sqrt{x}\sqrt{x}\sqrt{x}}x > 1$ then $\frac{d^2y}{dx^2}$ at $x = \log_e 3$ is

- (a) 3 (b) 0
(c) 5 (d) 1

143. If $f(1) = 1$, $f'(1) = 3$ then the derivative of $f(f(f(x))) + (f(x))^2$ at $x = 1$ is

- (a) 10 (b) 35
(c) 33 (d) 12

144. If $y = x^{\sin x} + (\sin x)^x$ then $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is

- (a) $\frac{4}{\pi}$ (b) 1
(c) $\pi \log \frac{\pi}{2}$ (d) $\frac{\pi^2}{2}$

145. If $A_n = \left[\begin{matrix} 1 & n \\ n & 1-n \end{matrix} \right]$ then $A_1 + A_2 + \dots + A_{2021} =$

- (a) -2021 (b) $(2021)^2$
(c) $-(2021)^2$ (d) 4042

146. The function $f(x) = \log(1+x) - \frac{2x}{2+x}$ is increasing on

- (a) $(-\infty, \infty)$ (b) $(-1, \infty)$
(c) $(\infty, -1)$ (d) $(-\infty, 0)$

147. The co-ordinates of the point on the $\sqrt{x} + \sqrt{y} = 6$ at which the tangent is equally inclined the axes is

- (a) (4,4) (b) (9,9)

- (c) (1,1) (d) (6,6)

148. The function $f(x) = 4\sin^3 x - 6\sin^2 x + 12\sin x + 100$ is strictly

- (a) decreasing in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (b) increasing in $\left(\pi, \frac{3\pi}{2}\right)$
(c) decreasing in $\left[0, \frac{\pi}{2}\right]$ (d) decreasing in $\left(\frac{\pi}{2}, \pi\right)$

149. If $[x]$ is the greatest integer function not greater than x then $\int_0^8 [x] dx$ is equal to

- (a) 28 (b) 29
(c) 30 (d) 20

150. $\int_0^{\pi/2} \sqrt{\sin \theta} \cos^3 \theta d\theta$ is equal to

- (a) $\frac{8}{23}$ (b) $\frac{8}{21}$
(c) $\frac{7}{23}$ (d) $\frac{7}{21}$

151. If $e^y + xy = e$ the ordered pair $\left(\frac{dy}{dx}, \frac{d^2y}{dx^2}\right)$ at $x = 0$ is equal to

- (a) $\left(\frac{1}{e}, \frac{1}{e^2}\right)$ (b) $\left(\frac{1}{e}, -\frac{1}{e^2}\right)$
(c) $\left(-\frac{1}{e}, -\frac{1}{e^2}\right)$ (d) $\left(-\frac{1}{e}, \frac{1}{e^2}\right)$

152. $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx$ is equal to

- (a) $2(\sin x - x \cos \alpha) + c$
(b) $2(\sin x - 2x \cos \alpha) + c$
(c) $2(\sin x + x \cos \alpha) + c$
(d) $2(\sin x + 2x \cos \alpha) + c$

153. $\int_0^1 \frac{xe^x}{(2+x)^3} dx$ is equal to

- (a) $\frac{1}{27}, e - \frac{1}{8}$ (b) $\frac{1}{9} \cdot e + \frac{1}{4}$
(c) $\frac{1}{27} \cdot c + \frac{1}{8}$ (d) $\frac{1}{9} \cdot e - \frac{1}{4}$

154. If $\int \frac{dx}{(x+2)(x^2+1)} = a \log |1+x^2| + b \tan^{-1} x + \frac{1}{5} \log |x+2| + c$, then

- (a) $a = \frac{-1}{10}$ $b = \frac{2}{5}$ (b) $a = \frac{-1}{10}$ $b = \frac{-2}{5}$
(c) $a = \frac{1}{10}$ $b = \frac{2}{5}$ (d) $a = \frac{1}{10}$ $b = \frac{-2}{5}$

155. Area of the region bounded by the curve $y = \tan x$, the x -axis and the line $x = \frac{\pi}{3}$ is

- (a) $\log_2 \frac{1}{2}$ (b) 0
(c) $\log 2$ (d) $-\log 2$

156. Evaluate $\int_2^3 x^2 dx$ as the limit of a sum

- (a) $\frac{72}{6}$ (b) $\frac{25}{7}$
(c) $\frac{53}{9}$ (d) $\frac{19}{3}$

157. $\int_0^{\pi/2} \frac{\cos x \sin x}{1 + \sin x} dx$ is equal to

- (a) $\log 2 - 1$ (b) $-\log 2$
(c) $\log 2$ (d) $1 - \log 2$

158. If $\frac{dy}{dx} + \frac{y}{x} = x^2$, then $2y(2) - y(1) =$

- (a) $\frac{11}{4}$ (b) $\frac{9}{4}$
(c) $\frac{15}{4}$ (d) $\frac{13}{4}$

159. The solution of the differential equation $\frac{dy}{dx} = (x + y)^2$ is

- (a) $\tan^{-1}(x + y) = x + c$ (b) $\cot^{-1}(x + y) = c$
(c) $\tan^{-1}(x + y) = 0$ (d) $\cot^{-1}(x + y) = x + c$

160. If $y(x)$ be the solution of differential equation $x \log x \frac{dy}{dx} + y = 2x \log x$, $y(e)$ is equal to

- (a) e (b) 2
(c) 0 (d) $2e$

161. If $|\vec{a}| = 2$ and $|\vec{b}| = 3$ and the angle between $\vec{a}$ and $\vec{b}$ is 120° , then the length of the vector $\left| \frac{1\vec{a}}{2} - \frac{1\vec{b}}{3} \right|^2$ is

- (a) 2 (b) $\frac{1}{6}$
(c) 3 (d) 1

162. If $|\vec{a} \times \vec{b}| + |\vec{a} \cdot \vec{b}|^2 = 36$ and $|\vec{a}| = 3$ then $|\vec{b}|$ is equal to

- (a) 9 (b) 4
(c) 36 (d) 2

163. If $\vec{\alpha} = \hat{i} - 3\hat{j}$, $\vec{\beta} = \hat{i} + 2\hat{j} - \hat{k}$ then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$ where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$ then $\vec{\beta}_1$ is given by

- (a) $-\frac{1}{2}(\hat{i} - 3\hat{j})$ (b) $\hat{i} - 3\hat{j}$
(c) $\frac{5}{8}(\hat{i} + 3\hat{j})$ (d) $\hat{i} + 3\hat{j}$

164. The sum of the degree and order of the differential equation $(1 + y_1^2)^{2/3} = y_2$ is

- (a) 4 (b) 5
(c) 6 (d) 7

165. The co-ordinates of foot of the perpendicular drawn from the origin to the plane $2x - 3y + 4z = 29$ are

- (a) (2,3,4) (b) (2, -3,4)
(c) (2, -3, -4) (d) (-2, -3,4)

166. The angle between the pair of lines $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and

$$\frac{x+1}{1} = \frac{y-4}{4} = \frac{z-5}{2} \text{ is}$$

- (a) $\theta = \cos^{-1} \left[\frac{19}{21} \right]$ (b) $\theta = \cos^{-1} \left[\frac{8\sqrt{3}}{15} \right]$
(c) $\theta = \cos^{-1} \left[\frac{5\sqrt{3}}{16} \right]$ (d) $\theta = \cos^{-1} \frac{31}{5\sqrt{42}}$

167. The corner points of the feasible region of an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5), then the minimum value of $z = 4x + 6y$ occurs at

- (a) finite number of points (b) only one point
(c) infinite number of points (d) only two points

168. A dietician has to develop a special diet using two foods X and Y. Each packet (containing 30 g) of food X contains 12 units of calcium, 44 units of cholesterol and 3 units of vitamin A. The diet requires atleast 240 units of calcium, atleast 460 units of iron and at most 300 units of cholesterol. The corner points of the feasible region are

- (a) (2,72), (40,15), (15,20) (b) (0,23), (40,15), (2,72)
(c) (2,72), (15,20), (0,23) (d) (2,72), (40,15), (115,0)

169. The distance of the point whose position vector is $(2\hat{i} + \hat{j} - \hat{k})$ from the plane $\vec{r} \cdot (\hat{i} - 2\hat{j} + 4\hat{k}) = 4$ is

- (a) $\frac{8}{\sqrt{21}}$ (b) $\frac{-8}{\sqrt{21}}$
(c) $8\sqrt{21}$ (d) $\frac{-8}{21}$

170. Find the mean number of heads in three tosses of a fair coin:

- (a) 1.5 (b) 2.5
(c) 4.5 (d) 3.5

171. If A and B are two events such that $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P\left(\frac{A}{B}\right) = \frac{1}{4}$, then $P(A' \cap B')$ is

- (a) $\frac{1}{4}$ (b) $\frac{1}{12}$
 (c) $\frac{3}{16}$ (d) $\frac{3}{4}$

172. A pandemic has been spreading all over the world The probabilities are 0.7 that there will be a lockdown, 0.8 that the pandemic is controlled in one month if there is a lockdown and 0.3 that it is controlled in one month if there is no lockdown. The probability that the pandemic will be controlled in one month is

- (a) 0.65 (b) 1.46
 (c) 1.65 (d) 0.46

173. If A and B are two independent events such that $P(\bar{A}) = 0.75$, $P(A \cup B) = 0.65$, and $P(B) = x$, then find the value of x

- (a) $\frac{5}{14}$ (b) $\frac{9}{14}$
 (c) $\frac{8}{15}$ (d) $\frac{7}{15}$

174. Suppose that the number of elements in set A is p, the number of elements in set B is q and the number of elements in $A \times B$ is 7 then $p^2 + q^2 =$

- (a) 50 (b) 42
 (c) 51 (d) 49

175. The domain of the function $f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$ is

- (a) $[-2,0) \cap (0,1)$ (b) $[-2,0)$
 (c) $[-2,1)$ (d) $[-2,0) \cup (0,1)$

176. The trigonometric function $y = \tan x$ in the II quadrant

- (a) decreases from 0 to ∞ (b) increases from 0 to ∞
 (c) decreases from $-\infty$ to 0 (d) increases from $-\infty$ to 0

177. The degree measure of $\frac{\pi}{32}$ is equal to

- (a) $5^\circ 30' 20''$ (b) $5^\circ 37' 30''$
 (c) $5^\circ 37' 20''$ (d) $4^\circ 30' 30''$

178. The value of $\sin \frac{5\pi}{12} \sin \frac{\pi}{12}$ is

- (a) 0 (b) $\frac{1}{2}$
 (c) 1 (d) $\frac{1}{4}$

179. $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 8\theta}}} =$

- (a) $\sin 2\theta$ (b) $2\sin \theta$
(c) $2\cos \theta$ (d) $2\cos \frac{\theta}{2}$

180. If $A = \{1, 2, 3, \dots, 10\}$ then number of subsets of A containing only odd numbers is

- (a) 31 (b) 32
(c) 27 (d) 30

Biology

181. A series of experiments were conducted by Frederick Griffith in 1928, on transforming principle with

- (a) *Streptococcus pneumoniae* (b) *Escherichia coli*
(c) *Bacillus thuringiensis* (d) *Salmonella typhimurium*

182. The number of codons effective in coding twenty amino acids:

- (a) 20 (b) 61
(c) 32 (d) 64

183. Which aspect forms the basis of DNA finger-printing?

- (a) The amount of DNA found in samples of blood, saliva and skin.
(b) The ratio of purines and pyrimidines present in DNA.
(c) The Sequence of DNA present in the ridges and grooves of finger-prints
(d) The Satellite DNA showing high degree of repetition in DNA segments.

184. Identify the most infectious and fatal type of malarial parasite:

- (a) *Plasmodium ovale* (b) *Plasmodium vivax*
(c) *Plasmodium malariae* (d) *Plasmodium falciparum*

185. The type of antibodies produced during the allergic reaction Options:

- (a) IgM (b) IgA
(c) IgE (d) IgG

186. One of the side-effects of the use of anabolic steroids in females

- (a) Masculinisation (b) Loss of memory
(c) Hallucination (d) Cirrhosis of liver

187. Which one of the following is a opiate narcotics?

- (a) LSD (b) Barbiturates
(c) Morphine (d) Amphetamines

188. The large holes in 'Swiss - Cheese' are made by a Options:

- (a) Fungus that releases a lot of gases during metabolic activities
(b) Machine

- (c) Bacterium that produces methane gas
(d) Bacterium producing a large amount of CO_2

189. Which vitamin is increased by 'LAB' in curd?

- (a) Vitamin E (b) Vitamin C
(c) Vitamin B (d) Vitamin B_{12}

190. Enzyme which is useful to remove the oily stains in laundry?

- (a) Lipase (b) Renin
(c) Protease (d) Amylase

191. DNA replicates semi conservatively was first shown in:

- (a) Higher animals (b) Escherichia coli
(c) Human cell (d) Plants

192. What does the sample of given base sequence represent?

5 - GAATTC - 3

3 - CTAAAG - 5

- (a) Palindromic sequence
(b) Initiator codon at S' end
(c) Deletion mutation
(d) Completion of replication

193. Gel electrophoresis is used for

- (a) Cutting of DNA into fragments.
(b) Construction of recombinant DNA by joining with cloning vectors.
(c) Isolation of DNA molecule.
(d) Separation of DNA fragments according to their size.

194. An antibiotic resistance gene in a vector usually helps in the selection of

- (a) Non-competent cells (b) Competent cells
(c) Transformed cells (d) Non-recombinant cells

195. Silencing of specific mRNA in RNAi is by

- (a) dsDNA (b) ssRNA
(c) dsRNA (d) ssDNA

196. Cry-IAC effectively controls,

- (a) Ring worm
- (b) Cotton bollworms
- (c) Corn borer
- (d) Root nematode

197. ADA deficiency can be cured by

- (a) Heart Transplantation
- (b) Bone-marrow Transplantation
- (c) Liver Transplantation
- (d) Kidney Transplantation

198. Average natality rate in our village is 25, average mortality is 24, immigration 2 and emigration 3 and the net increase in population is:

- (a) 27
- (b) 0
- (c) 5
- (d) 10

199. The term "Molecular Scissors" refers to

- (a) Tag polymerase
- (b) Polymerase-I
- (c) Polymerase-I
- (d) Restriction enzyme

200. The animals which are active during day time:

- (a) Cresporal
- (b) Diurnal
- (c) Auroral
- (d) Vesporal

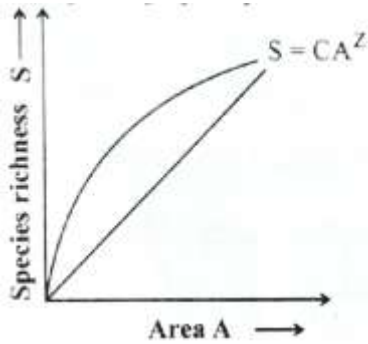
201. Which of the following statement is incorrect related to biomes?

- (a) Low temperature and less rainfall is a characteristics of Tundra biomes.
- (b) Variation in temperature and mean precipitation accounts for the major biomes,
- (c) More rainfall and low temperature is the characteristics of deserts.
- (d) High temperature and minimum rainfall help to form grasslands.

202. The amount of Photosynthetically active radiation captured by plants is

- (a) 12-20 percent
- (b) 20-30 percent
- (c) 2-10 percent
- (d) 60-70 percent

203. The given graph represents



- (a) Population growth
- (b) Enzyme activity
- (c) Species area relationship
- (d) Growth of organisms

204. Cuscuta is an example of

- (a) Predation
- (b) Broad Parasitism
- (c) Endoparasitism
- (d) Ectoparasitism

205. Particulates of..... size pose greatest risk to human health. Options:

- (a) Less than 7.5 micrometers in diameter
- (b) Less than 2.5 micrometers in diameter
- (c) Less than 4.5 micrometers in diameter
- (d) Less than 3.5 micrometers in diameter

206. Maintenance of constant internal environment is called as

- (a) Osmoregulation
- (b) Metastasis
- (c) Homeostasis
- (d) Thermoregulation

207. Bovine spongiform encephalopathy is caused by

- (a) Fungi
- (b) Viroids
- (c) Prions
- (d) Virus

208. Phycoerythrin and Floridian starch is found in

- (a) Red algae
- (b) Blue - green algae
- (c) Green algae
- (d) Brown algae

209. Different types of respiratory organs like gills, book gills, book lungs and trachea are present in

- (a) Annelids
- (b) Sponges
- (c) Molluses
- (d) Arthropods

210. Which of the following plant is used to extract Colchicine?

- (a) Tulip (b) Colchicum
(c) Aloe (d) Asparagus

211. Rows of S-shaped setae in the body of earthworm are present in all the segments, except

- (a) the first segment
(b) the last segment
(c) the first and last segment
(d) the first, last and clitellum

212. Cell theory was formulated by

- (a) Schwann and Robert Brown
(b) Schleiden and Schwann
(c) Robert Hook and Robert Brown
(d) Schleiden and Robert Brown

213. The type of Polysaccharide present in a cotton fibre

- (a) Glycogen (b) Starch
(c) Insulin (d) Cellulose

214. Enzyme involved in crossing over

- (a) Ligase (b) Recombinase
(c) Polymerase (d) Endonuclease

215. Kranz anatomy can be seen in

- (a) Maize (b) Tomato
(c) Potato (d) Pea

216. Respiratory quotient of glucose is

- (a) 1.0 (b) 0
(c) 0.7 (d) 0.9

217. A person suddenly starts coughing while swallowing food This coughing would have been due to improper movement of

- (a) Tongue (b) Epiglottis
(c) Diaphragm (d) Neck

218. Binomial nomenclature is introduced by

- (a) John Ray (b) Carolus Linnaeus

(c) Lamarck (d) Bentham and Hooker

219. Filtration of blood during urine formation takes place in Options:

- (a) Glomerulus (b) DCT
(c) PCT (d) Collecting duct

220. Corpus Callosum connects the

- (a) Spinal cord with the brain
(b) Two lobes of cerebellum
(c) Two cerebral hemispheres
(d) Cerebrum and cerebellum

221. Menstrual cycle is exhibited by:

- (a) Tiger (b) Cow
(c) Rat (d) Apes

222. An example of dioecious plant:

- (a) Papaya (b) Cucurbita
(c) Coconut (d) Mango

223. Stalk of the Stamen is:

- (a) Peduncle (b) Filament
(c) Pedicel (d) Petiole

224. The ovule of angiosperm is technically known as:

- (a) Megaspore (b) Megasporangium
(c) Mega sporophyll (d) Megaspore mother cell

225. Typical mature embryosae of angiosperm is

- (a) 8 nucleated 1 celled structure
(b) 8 nucleated 8 celled structure
(c) 8 nucleated 7 celled structure
(d) 7 nucleated 8 celled structure

226. One of the 2000 years old viable seed, discovered during the archeological excavation at King Herold's near dead sea

- (a) Lupin (b) Sunflower
(c) Phoenix dactylifera (d) Maize

227. The testis are situated outside the abdominal cavity in scortum as it helps to

- (a) Regulates hormone secretion

- (b) Store sperm
- (c) Release sperm
- (d) Maintain the low temperature

228. Identify the odd one from the following:

- (a) Isthmus (b) Fimbriae
- (c) Labia minora (d) Infundibulum

229. In which month of gestation, the first movements of foetus and appearance of hair on its head is observed?

- (a) 8th month (b) 1st month
- (c) 4th month (d) 5th month

230. The most abundant type of WBC cells

- (a) Monocytes (b) Basophils
- (c) Neutrophils (d) Eosinophils

231. Which of the following is correctly matched?

- (a) Spores - Sponge
- (b) Conidia - Hydra
- (c) Gemmules - Amoeba
- (d) Bulbil - Agave

232. The technique advised by a doctor to overcome the problem of infertility :

- (a) RTI (b) MTP
- (c) ART (d) RCH

233. Amniocentesis is a process to:

- (a) Determine the sex of the foetus
- (b) Determine any disease of heart
- (c) Know about the disease of brain
- (d) To grow cell on culture medium

234. The first human like being is

- (a) Homo menthus (b) Homo erectus
- (c) Homo habilis (d) Homo sapiens

235. XO type of sex determination and XY type of sex determination are the examples of

- (a) Female Homogamety (b) Male Heterogamety
- (c) Female Heterogamety (d) Male Homogamety

236. Example for Non-Mendelian disorder:

- (a) Cystic fibrosis (b) Haemophilia
- (c) Down's syndrome (d) Thalassemia

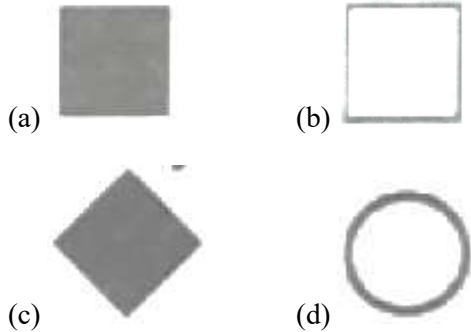
237. Gynecomastia is a symptom of

- (a) Cri-du-chat syndrome
- (b) Down's syndrome

(c) Kline Felter's syndrome

(d) Turner's syndrome

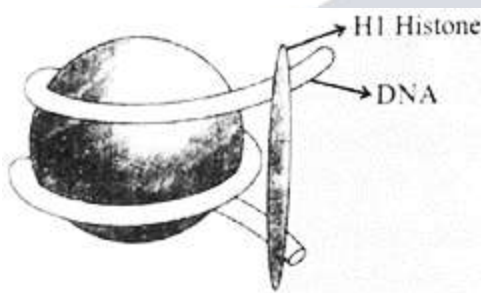
238. The affected male in the pedigree chart is symbolized by:



(a) (A) (b) (B)

(c) (C) (d) (D)

239. The given diagram represents: Biology Question Image



(a) Mesosome (b) Chromosome

(c) Ribosome (d) Nucleosome

240. Which of the following hormones is not secreted by human placenta?

(a) FSH

(b) hCG

(c) Relaxin

(d) Progestogen